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Erik Paulsen

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EXAMINER

TRAN, THANH Y

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 09/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/881,151

Applicant(s)

ERIK PAULSEN

Examiner

Thanh Y. Tran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 May 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 23 is/are allowed.
- 6) ☒ Claim(s) 1-22 and 24-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Applicant's arguments with respect to claims 1-25 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-12 and 14-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Gedney et al (U.S. 5,483,421).

With respect claim 1, Gedney et al discloses a device (Fig. 5), comprising: a board (24) having a first side and a second side in a parallel relationship, the first and second sides being separated from each other by a thickness of the board (24), the board further having third through sixth sides (front, rear, left, and right sides) that are parallel to the thickness of the board (24), the third (front side) and fifth sides (rear side) being parallel to each other, the fourth and sixth sides (left and right sides) being parallel to each other, and the third (front) and fourth (left) sides being orthogonal to each other, wherein the first side includes a first set of contacts (30) suitable for electrically contacting an integrated circuit (20) having a first configuration; and the second side includes a second set of contacts (32) suitable for electrically contacting a circuit board (38) having a second configuration, wherein the second set of contacts (32) are communicatively coupled to the first set of contacts (see element 35); the board (24) being defined by a z axis, a y

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axis, and an x axis, in which the x, y, and z axes are mutually orthogonal, the z axis being orthogonal to the first and second sides (top and bottom sides) and corresponding to the thickness of the board (24), the x axis being parallel to the third and fifth sides, the y axis being parallel to the fourth and six sides, wherein at least one of the first set of contacts (30) is electrically connected to a corresponding one of the second set of contacts (32) such that these two contacts have a non-zero x offset (view from front to rear of board 24, there is a non-zero x offset), a non-zero y offset (view from left to right of board 24, there is a non-zero y offset), and a non-zero z offset (view from top through bottom of board 24, there is a non-zero z offset) with respect to each other, wherein contacts (30) having a function configured in the first configuration are not arranged with contacts (32) having a corresponding function configured in the second configuration, and wherein the set of contacts (30) of the first configuration and the second configuration have a *substantially* similar size (see figure 5, contacts 30 and contacts 32 have *substantially* similar sizes). [It should be noted that: since the third contact (third pad 30) on the first side of the board is communicatively coupled to the second contact (second pad 32) on the second side of the board, it is considered that the contacts (pad 30) having a function configured in the first configuration are not arranged with contacts (pads 32) having a corresponding function configured in the second configuration].

With respect to claims 2 and 9, Gedney et al discloses a device (Fig. 5), wherein a device (24) having the first configuration is unsuitable for direct contact and operation with a device (24) having the second configuration.

With respect to claim 3, Gedney et al discloses a device (Fig. 5) comprising an integrated circuit (20) having a set of contacts (36) arranged in the first configuration and a circuit board (38) having a set of contacts (44) arranged in the second configuration.

With respect to claim 4, Gedney et al discloses a device (Fig. 5) wherein the integrated circuit set of contacts (36) includes at least one contact having a function corresponding to a function of a contact (44) of the circuit board (38), the integrated circuit contact (36) positioned so that when the integrated circuit (20) is arranged with the circuit board (38), the integrated circuit contact (36) is not positioned for electrical coupling to the contact of the circuit board (38) having a corresponding function.

With respect claim 5, Gedney et al discloses a device (Fig. 5) wherein the board includes a ground layer and a power layer (see col. 1, lines 13-21 and col. 6, lines 32-40). It should be noted that: since the boards provide the various power and ground I/O signal lines to the integrated chips, it is known that the boards including a ground layer (ground signal line) and a power layer (power signal line).

With respect to claim 6, Gedney et al discloses a device (Fig. 5) wherein the first set of contacts (30) is electrically connected over an electrical connection (see elements 34 or 35) to the second set of contacts (32).

With respect to claim 7, Gedney et al discloses an apparatus (Fig. 5), comprising: an integrated circuit (20) including a set of contacts (36), wherein the integrated circuit set of contacts (36) is suitable for operation in a first configuration, the first configuration having an arrangement of contacts (36) and corresponding functions of arranged integrated circuit contacts (36); a circuit board (38) including a set of contacts (30), wherein the circuit board set of contacts

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(30) is suitable for operation in a second configuration, the second configuration having an arrangement of contacts (30) and corresponding functions of arranged circuit board contacts (30), wherein the contacts (30) of the second configuration are situated to correspond to the contacts (36) of the first configuration of the integrated circuit (20), and arrangement of functions of the contacts (30) of the second configuration does not correspond to arrangement of functions of the contacts (36) of the first configuration [it should be noted that: since the second and fifth contacts (fifth ball 36) of the first configuration are not coupled to the second and fifth contacts (44) of the second configuration, it is considered that arrangement of functions of the contacts (30) of the second configuration does not correspond to arrangement of functions of the contacts (36) of the first configuration]; and a converter device (24) disposed between the integrated circuit (20) and the circuit board (38), wherein the converter device (24) includes a first set of contacts (30) suitable for contacting the integrated circuit (20) having the first configuration, and a second set of contacts (32) suitable for contacting the circuit board (38) having the second configuration, wherein the first set of contacts (30) is communicatively coupled to the second set of contacts (32) (see elements 34 and 35) and wherein contacts (30) having a function configured in the first configuration are not arranged with contacts (32) having a corresponding function configured in the second configuration [it should be noted that: since the third contact (third pad 36) is coupled to the second contact (second pad 32) not the third pad 32, it is considered that contacts having a function configured in the first configuration are not arranged with contacts having a corresponding function configured in the second configuration], wherein an electrical connection (34 or 35) within the converter device (24) extends along the x

and y axes of the converter device, the electrical connection electrically connecting at least one of the first set of contacts (30) with at least one of the second set of contacts (32).

With respect to claim 8, Gedney et al discloses a device (Fig. 5) wherein contacts (36) of the integrated circuit (20) having a function configured in the first configuration are not arranged with contacts (44) of the circuit board (44) having a corresponding function configured in the second configuration.

With respect to claim 10, Gedney et al discloses a device (Fig. 5) wherein the first set of contacts (30) is disposed to the second set of contacts (32) as at least one of opposing sides of the device (24) and sharing a side of the device (24).

Claim 11 recites limitations similar to claim 4. Therefore, it is rejected for the same reasons.

With respect to claim 12, Gedney et al discloses a device (Fig. 5) wherein the device (24) includes a first converter board (26-28) and a second converter board (38), a third set of contacts (44) and a fourth set of contacts (42), the third and fourth sets of contacts being arranged on opposing sides of the second converter board (24), wherein the first converter board (26-28) includes first and second sets of contacts (30, 32) and the second converter board (38) includes third (44) and fourth sets of contacts (42), the first and second sets of contacts (30, 32) being communicatively coupled through the first converter board (24), the second set of contacts (32) positioned for contacting the third set of contacts (44), the third set of contacts (44) being communicatively coupled to the fourth set of contacts (42) through the second converter board (38).

With respect to claim 14, as best understood, Gedney et al discloses an apparatus (Fig. 5), comprising: an integrated circuit (20) including a set of contacts (36), wherein the integrated circuit set of contacts (36) is suitable for operation in a first configuration, the first configuration having an arrangement of contacts (36) and corresponding functions of arranged integrated circuit contacts (36); a circuit board (38) including a set of contacts (44), wherein the circuit board set of contacts (44) is suitable for operation in a second configuration, the second configuration having an arrangement of contacts (44) and corresponding functions of arranged circuit board contacts (44), wherein the contacts (44) of the second configuration are situated to correspond to the contacts (36) of the first configuration of the integrated circuit (20), and arrangement of functions of the contacts (44) of the second configuration does not correspond to arrangement of functions of the contacts (36) of the first configuration; and a device (24) disposed between the integrated circuit (20) and the circuit board (38), wherein the device (24) includes a first set of contacts (30) suitable for contacting the integrated circuit (20) having the first configuration and a second set of contacts (32) suitable for contacting the circuit board (38) having the second configuration, the first set of contacts (30) electrically coupled to the second set of contacts (32) via electrical connections (see elements 34, 35), wherein the electrical connections (see elements 34 and 35) extend within the converter device (24) along the x (view from front to rear of board 24, there is an x axis) and y (view from left to right of board 24, there is a y axis) axes of the converter device and also extend within the converter device (24) along the z axis (view from top through bottom of board 24, there is a z axis) of the converter device, wherein contacts (30) having a function configured in the first configuration are not arranged with contacts (32) having a corresponding function configured in the second configuration [it

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should be noted that: since the third contact (third pad 30) on the first side of the board (24) is communicatively coupled to the second contact (second pad 32) on the second side of the board (24), it is considered that the contacts (pad 30) having a function configured in the first configuration are not arranged with contacts (pads 32) having a corresponding function configured in the second configuration].

With respect to claim 15, figure 5 of Gedney et al shows an integrated circuit (20) configured for contacting the first set of contacts (30) of the device (24) includes at least one contact (30) positioned so as to be unsuitable for direct contact and operation with the circuit board (38).

Claim 16 recites limitations similar to claim 2. Therefore, it is rejected for the same reasons.

Claim 17 recites limitations similar to claim 10. Therefore, it is rejected for the same reasons.

Claim 18 recites limitations similar to claim 1. Therefore, it is rejected for the same reasons.

Claim 19 recites limitations similar to claim 12. Therefore, it is rejected for the same reasons.

With respect to claims 20 and 22, Gedney et al discloses a device (Fig. 5) wherein the first converter board (26-28) includes the first and second sets of contacts (30, 32) and the second converter board (38) includes the third and fourth sets of contacts (44, 42), the first set of contacts (30) being communicatively coupled to the second set of contacts (32) through the first converter board (24), the second set of contacts (32) positioned for contacting the third set of

contacts (44), the third and fourth sets of contacts (44,42) being communicatively coupled through the second converter board (38), wherein the second and fourth sets of contacts (44, 42) include solder balls or spherical contacts.

With respect to claim 21, Gedney et al discloses a device (Fig. 5) wherein the first converter board (26-28) includes the first and second sets of contacts (30, 32) and the second converter board (38) includes the third and fourth sets of contacts (44, 42), the first set of contacts (30) being communicatively coupled to the second set of contacts (32) through the first converter board (24), the second set of contacts (32) positioned for contacting the third set of contacts (44), the third and fourth sets of contacts (44,42) being communicatively coupled through the second converter board (38), wherein the second and fourth sets of contacts (44, 42) include contacts round in cross section.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gedney (U.S. 5,483,421) in view of Tay et al (U.S. 2002/0153602).

With respect to claim 13, Gedney et al does not disclose the apparatus comprising a third converter board, a fifth set of contacts and a sixth set of contacts, the fifth and the sixth sets of contacts being arranged on opposing sides of the third converter board, wherein the first

converter board includes first and second sets of contacts the second converter board includes third and fourth sets of contacts and the third converter board includes fifth and sixth sets of contacts, the first and second sets of contacts being communicatively coupled through the first converter board, the second set of contacts positioned for contacting the third set of contacts, the third set of contacts being communicatively coupled to the fourth set of contacts through the second converter board, the fourth set of contacts positioned for contacting the fifth set of contacts, the fifth set of contacts being communicatively coupled to the sixth set of contacts through the third converter board.

Tay et al (U.S. 2002/0153602) discloses in figure 13 an apparatus comprising a third converter board (120), a fifth set of contacts (contact pads bonded on bottom surface of board 120) and a sixth set of contacts (contact balls attached to contact pads on bottom surface of board 120), the fifth and the sixth sets of contacts being arranged on opposing sides of the third converter board, wherein the first converter board (top board) includes first and second sets of contacts the second converter board (second board is a board position between the top board and board 120) includes third and fourth sets of contacts, and the third converter board (120) includes fifth and sixth sets of contacts, the first and second sets of contacts being communicatively coupled through the first converter board, the second set of contacts positioned for contacting the third set of contacts, the third set of contacts being communicatively coupled to the fourth set of contacts through the second converter board, the fourth set of contacts positioned for contacting the fifth set of contacts, the fifth set of contacts being communicatively coupled to the sixth set of contacts through the third converter board (120). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the apparatus

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of Gedney et al by including a third converter board which has a fifth set of contacts and a sixth set of contacts as taught by Tay et al for communicatively coupling to other set of contacts of the first and second converter boards of the apparatus for use in improved stackable semiconductor package.

5. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gedney (U.S. 5,483,421) in view of Robbins et al (U.S. 6,365,839).

With respect to claim 24, claim 24 recites limitation similar to claim 14. Gedney et al further discloses in figure 5 an apparatus wherein the converter device (24) is formed of interior layers: having first dielectric (26), a ground plane (ground), second dielectric (second dielectric is the middle board located between board 26 and 28), signal, and third dielectric (28) (see figure 5, col. 6, lines 32-43).

Gedney et al does not disclose the converter device including fourth dielectric and fifth dielectric. Robbins et al (U.S. 6,365,839) discloses in figure 3 a device (300) is formed of interior layers having first dielectric (310), a ground plane (ground) (332), second dielectric (312), signal (344), third dielectric (314), power (342), fourth dielectric (316) and fifth dielectric (318). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the device of Gedney et al by including fourth dielectric and fifth dielectric as taught by Robbins et al. One of ordinary skill in the art would have been motivated because a device including a plurality of dielectrics or dielectric layers would be formed for use in high-density packages.

6. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gedney (U.S. 5,483,421).

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With respect to claim 25, Gedney et al does not teach the thickness of the converter device (converter board). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the device/board of Gedney et al by providing a specific thickness for each layer of the board, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Allowable Subject Matter

7. Claim 23 is allowed.

8. The following is a statement of reasons for the indication of allowable subject matter: claim 23 recites, inter alia, *“an apparatus comprising: a ball grid array integrated circuit having a first configuration of contacts; and a circuit board in physical and electrical contact with the fourth round contact, the circuit board having a second configuration of contacts which are not arranged with contacts having a corresponding function configured in the first configuration, wherein the ball grid array integrated circuit and the circuit board sandwich the first, second, third, and fourth round contacts and the first, second, and third converter boards”*; in the combination with other claimed features.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Corisis et al (U.S. 2002/0135066) discloses stackable ball grid array package.

Response to Arguments

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10. Applicant argued that Gedney does not clearly teach that at least one of the first set of contacts is electrically connected to a corresponding one of the second set of contacts such that these two contacts have a non-zero y offset.

In response, by carefully reviewing at the previous Office Action, the Examiner changes the 35 U.S.C. 103(a) rejection under Gedney to 35 U.S.C. 102(b) rejection under Gedney for claims 1-12 and 14-24 because the reference of Gedney teaches an apparatus in figure 5 having at least one of the first set of contacts (30) is electrically connected to a corresponding one of the second set of contacts (32) such that these two contacts (30, 32) have a non-zero y offset. The y axis is defined in claim 1 as an axis being parallel to the fourth and six sides (left side and right side of board 24), thus when looking/viewing from the left side to right side of board 24, one of ordinary skill in art would see there is a non-zero y offset between the two contacts (30, 32). Because of the above-mentioned reasons, the Examiner disagrees with Applicant's argument.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Y. Tran whose telephone number is (571) 272-2110. The examiner can normally be reached on M-F (9-6:30pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TYT



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